

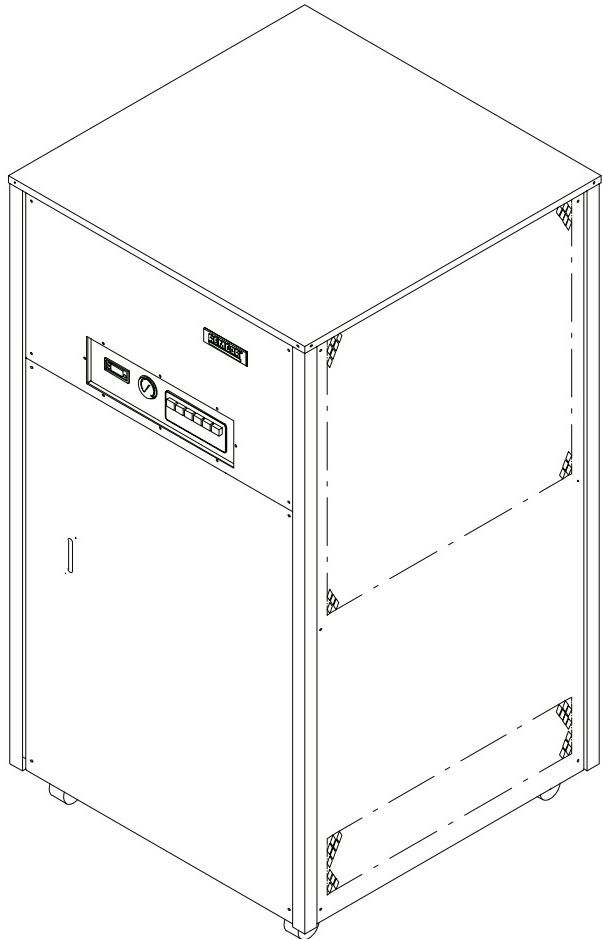


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## CHILLER

### Models: CH1500–CH7500

## Operator's Manual



Part No. 91961

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Revision D

#### THIS DOCUMENT CONTAINS IMPORTANT INFORMATION

This Manual must be read and understood before installing or operating this equipment

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# GENERAL INFORMATION

## INTRODUCTION

Remcor "CH" Series Refrigerated Recirculating Water Chillers are designed to provide a continuous flow of clean cooling water at a constant temperature and to handle a variety of closed loop and tank cooling applications.

The CH consists of a refrigeration system with associated operating controls housed in a sturdy sheet metal cabinet. A standard pump and reservoir package provides a complete self-contained water cooling and circulating system.

CH Chillers are designed to operate in a clean laboratory or industrial environment where ambient temperatures range from 40°F to 110°F. Once properly installed, the CH Chiller will run virtually maintenance free and provide a constant supply of cooling liquid to the application.

**NOTE: Please read through this manual before starting the chiller.**

SPECIFICATIONS					
Model	CH1500	CH2000	CH3000	CH5000	CH7500
Cooling Capacity* Watts/BTU	5,570/19,000	8,500/29,000	12,000/41,000	18,000/61,500	25,800/85,000
Compressor	1.5 H.P.	2 H.P.	3 H.P.	5 H.P.	7.5 H.P.
Condenser	Air Cooled (Water Cooled Optional)				
Temperature Controller	Digital Display 30–100° F (0–39°C.)				
Pump**	Many Available				
Reservoir	10 Gallons			40 Gallons	
Voltage (Full Load Amps)***	230/60/1(17) 230/60/3(13) 460/60/3(8)	230/60/3(13) 460/60/3(8)	230/60/3(16) 460/60/3(10)	230/60/3(26.5) 460/60/3(14)	230/60/3(35) 460/60/3(22)
Dimensions W x D x H (inches)	28 x 28 41			36 x 36 x 65	
Inlet/Outlet Fitting Size	3/4-inch			1-inch	

## SPECIFICATION NOTES

1. The figures for power and cooling capacity are listed for air-cooled units with a circulation temperature of 68° F, and ambient temperature of 80°F and standard pump.
2. Cooling capacity will be affected as follows: Derate 17% for 50 Hz operation. Derate 1% for each °F drop in recirculating temperature. Derate .5% for each °F increase in ambient temperature. Optional pumps will decrease net cooling capacity.
3. The operating water temperature range for water is 40°F (5°C) to 100°F (38°C). If use of other fluids or temperatures are required, the Remcor Technical Support Department must be contacted so the appropriate ranges can be set.
4. Water-cooled units require about 20% less input power.
5. All CH Chillers are thoroughly tested before leaving the REMCOR® factory to ensure that each unit meets these specifications prior to shipment.



**WARNING: Never operate the Chiller with the panels removed. Always use the power switch to turn off the Chiller when it is not being used. Always ensure that all air inlets and outlets are free from obstruction.**

# INSTALLATION

## LOCATION

Install the Chiller indoors in a well ventilated area where ambient temperatures will never fall below 40°F or rise above 110°F. To obtain optimum cooling capacity, the ambient temperature should be 80°F or below.

Standard CH Chiller have air-cooled condensers. On air-cooled units it is important that the air intake and discharge are not obstructed. Avoid hot air discharge from other equipment or enclosed areas where heat build-up could cause a significant rise in ambient temperatures. A minimum of two feet of space on all four sides of the Chiller will be sufficient to prevent obstruction. Water-cooled units should be located near a water source and drain.

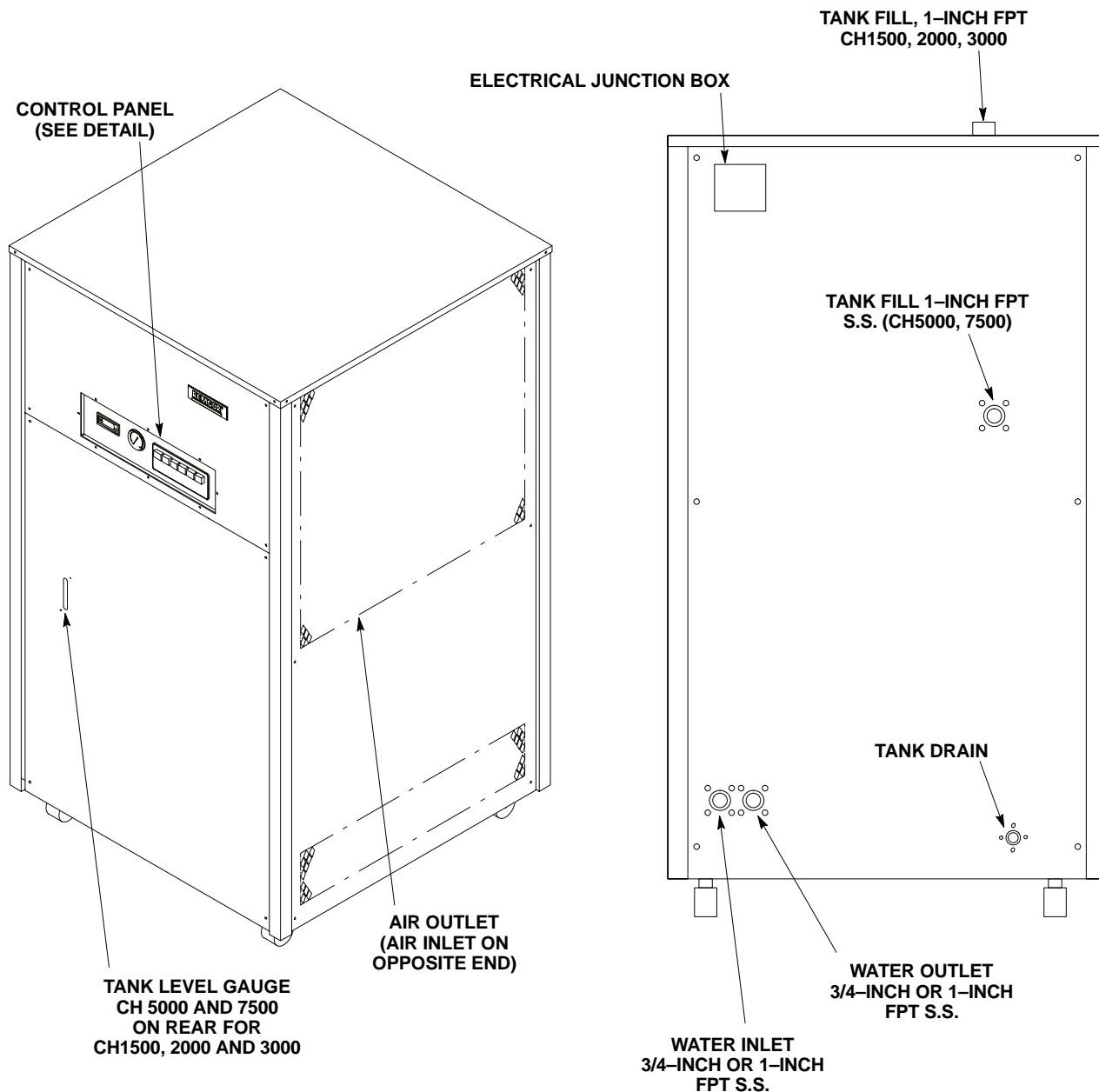


FIGURE 1. INSTALLATION DETAILS

## ELECTRICAL

All wiring must conform to the National Electric Code and any applicable local codes. The Chiller must be PERMANENTLY wired by means of electrical conduit to a properly fused disconnect of proper amperage or wired to a properly rated power cord and plugged into an outlet with the appropriate disconnect and amperage rating. The electrical junction box located on the upper rear of the Chiller, includes a four-terminal strip for power supply connections. The DATA PLATE, located beside the junction box, indicates the actual phase, voltage and amperage for each Chiller.

After the electrical connections are made, power *must* be supplied to the Chiller for a period of 12 hours (with control switched off) to allow the compressor crankcase heater to warm the compressor lubricant.



**CAUTION:** On three phase applications, it is important that the rotation of the pump, when supplied, is correct. Running the pump in reverse for more than a few seconds will result in permanent pump damage. When the pump is running, shaft rotation must match the direction indicated on the pump housing. If the rotation is incorrect, reverse two of the three incoming power supply leads. The Phase Protection/3-Phase Monitor Option will prevent the pump from operating backwards. See the option description.

### Phase Protection / 3-Phase Option

The 3-Phase Monitor detects phase loss, low voltage, and phase reversal by continuously monitoring the 3-Phase power lines for abnormal conditions. When correct voltage and phase rotation are applied, the internal relay will energize. A fault condition will de-energize the relay. When the fault is corrected, the monitor will automatically reset. Both **Trip** and **Norm** condition indicators are provided on the relay to aid in adjustment and system trouble-shooting.

This control is located in the enclosure labeled "Monitor" on top of the electrical box.

### Phase Protection / 3-Phase Option Adjustment

The following procedure will allow the 3-Phase Monitor to achieve a trip point just below the nominal phase-to-phase voltage, where the unit is applied.

Rotate the adjustment control fully clockwise, or until the red (Trip) indicator illuminated. Slowly rotate the adjustment control in a counter-clockwise direction, just until the green (Norm) indicator illuminates. At this point, the 3-Phase Monitor is the most sensitive to irregular power line conditions. If nuisance tripping occurs, turn the control slightly further counter-clockwise.

## PLUMBING

Follow standard plumbing practices and local codes in making water connections. The Chiller inlet and outlet connections are 3/4-inch or 1-inch FPT. Flexible hose and fittings are recommended for plumbing the system. A No. 20 mesh strainer should be installed on the Chiller inlet to prevent foreign particles from entering the system and should be cleaned monthly. Lines should be routed with as few bends as possible. Prevent lines from running near radiators, hot water pipes, etc. Any lengths of tubing that are exposed to high ambient temperatures should be insulated to prevent condensation and/or significant liquid heat loss.

### Water-Cooled Condensers

Water-cooled units must be connected to a source of tap water or chilled water and a drain. The connections for the water supply (3/4-inch FPT or 1-inch FPT) are located on the rear of the unit. These units are supplied with a **WATER REGULATING VALVE** that allows only the required amount of water to pass through the condenser for a given heat load. The water flow through the condenser can vary from 0 when the cooling system is in the "OFF" cycle to approximately 5.0-gpm at maximum rated loads for 1-1/2 ton units and approximately 20-gpm at maximum rated loads for 7-1/2 ton units. This valve is factory set to operate where the water supply temperature ranges from 50°F (10°C) to 80°F (27°C) with a supply pressure of 30 to 60-PSIG. For temperatures or pressure outside these ranges, contact our Technical Service Department for assistance in "field" adjustment of the valve. Once the system has been properly plumbed, it is important that the circulation system be filled with water.

## **Chiller with Reservoir**

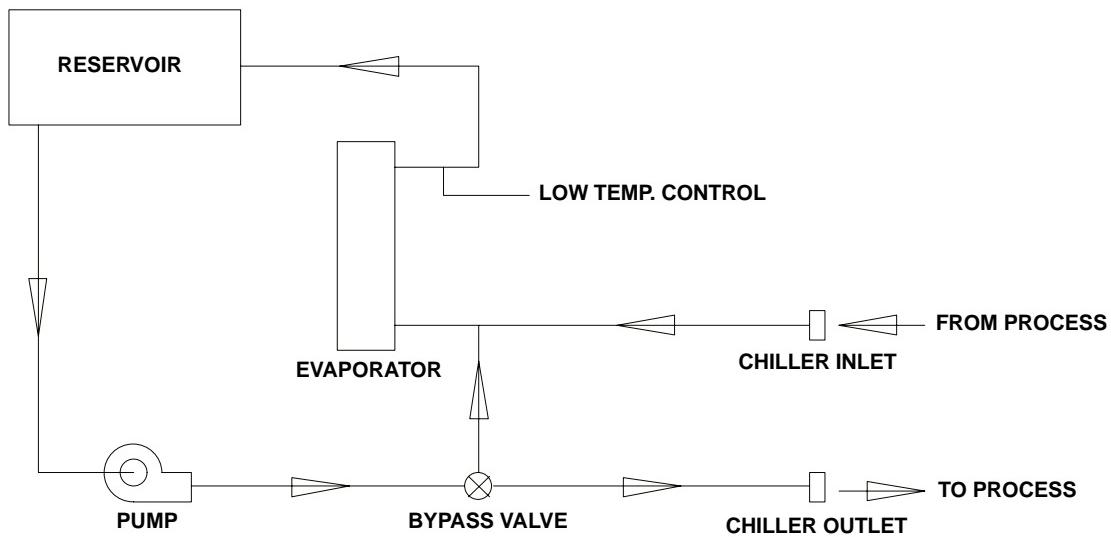
The reservoir can be filled by removing the water fill cap located on the upper rear of the Chiller (See Fluid Recommendations page). After ensuring that the drain valve is closed, fill the reservoir via the full port with clean water until the water level sight glass on the front of the unit indicates "FULL" the fill cap should then be reinstalled before operation begins.

### **Auto Refill Option**

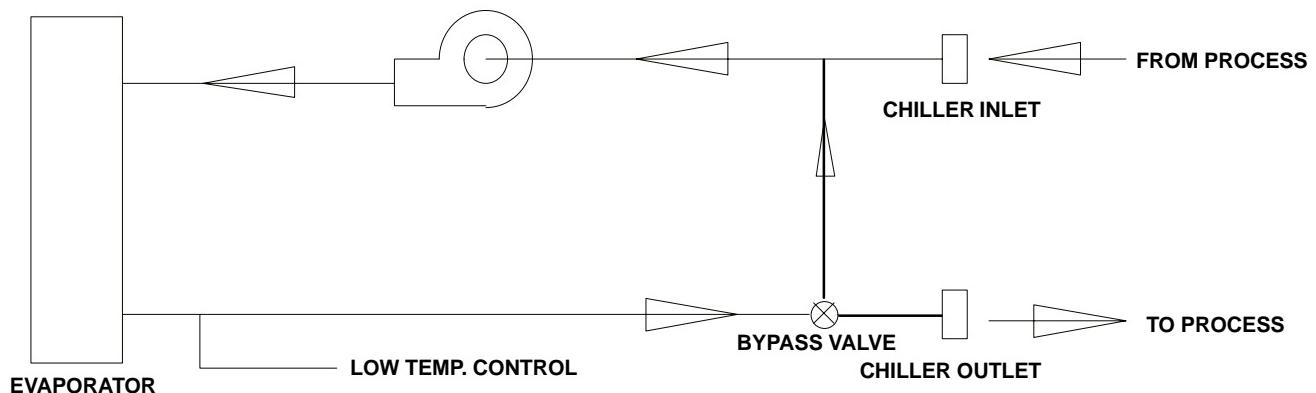
If the Chiller is provided with the Auto Refill Option, install 1/4-inch or 1/2-inch tubing from the auto refill fitting located on the lower rear of the Chiller to a fresh water supply line. The Chiller reservoir will fill with water automatically and the proper reservoir level will always be maintained.

### **Chiller without Reservoir**

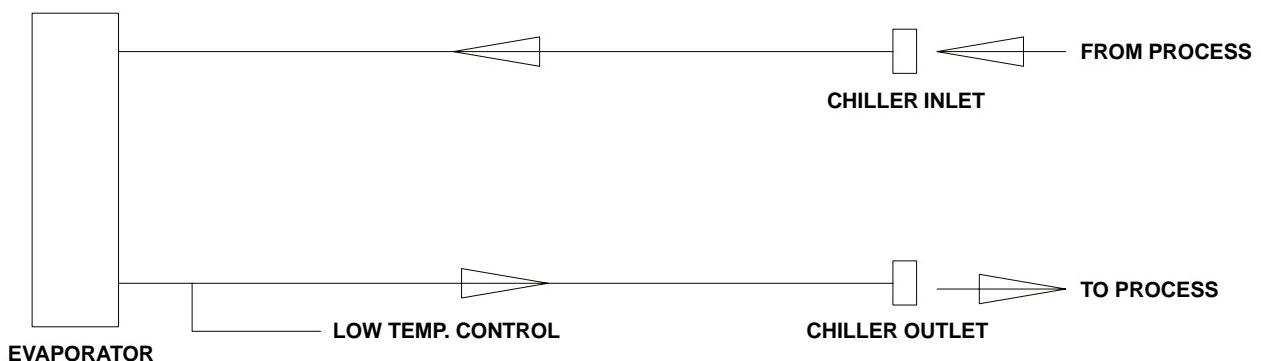
The Chiller and system piping should be filled with clean water ensuring that all air is purged from the system.



**FIGURE 2. CHILLER PLUMBING SCHEMATIC WITH PUMP AND TANK (STANDARD)**



**FIGURE 3. CHILLER PLUMBING SCHEMATIC NO TANK (OPTION)**



**FIGURE 4. CHILLER PLUMBING SCHEMATIC NO PUMP, NO TANK (OPTION)**

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# START UP

## WATER FLOW START-UP

### Chiller with Pump

It is important to check the pump rotation on the three phase units. Remove the lower side panel to expose the pump. Turn the pump power switch to the "ON" position for a few seconds. Observe the motor shaft to ensure that it is turning in the direction indicated by the arrow located on the pump housing. If the rotation is incorrect, reverse two of the three incoming power supply leads at the terminal strip. After changing the leads, check the pump rotation.

**NOTE: Running the pump in reverse for more than a few seconds will result in permanent pump damage.**

After ensuring that the system piping is free from obstruction and that all valves are open, turn the pump power switch to the "ON" position. The pump power indicator should illuminate, indicating that the pump is operating.

All Chillers with pumps are provided with a pressure regulating valve on the pump discharge. This valve is preset at the factory to ensure that system pressure does not exceed the capabilities of the pump motor and/or piping. If this valve requires adjustment, please contact the factory for proper setting procedure and pressures.

A flow meter and throttling valve can be added in the chiller inlet line in order to monitor and/or adjust the flow rate through the Chiller.

Once the flow has been established, the thermostat can be adjusted to the desired set-point.

### Chiller without Pump

A flow meter and throttling valve can be added in the Chiller inlet line in order to monitor and/or adjust the flow rate through the Chiller.

Once the flow has been established, the thermostat can be adjusted to the desired set-point. See thermostat adjustment.

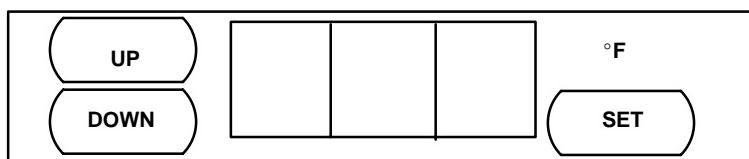
## THERMOSTAT ADJUSTMENT

### Standard Thermostat

The following procedure should be followed to adjust the standard thermostat:

1. Push the "SET" button located to the right of the digital display. The current set-point will be displayed.
2. While holding the "SET" button, push the "UP" or "DOWN" button until the desired set-point is displayed.
3. Release "SET" button. The display will show the system water temperature. The set-point can be viewed at any time by pressing the "SET" button.

The thermostat has a range that has been preset at the factory. The range is 40°F (5°C) to 100°F (38°C). If operation outside of this range is required, please contact the Remcor Technical Service Department.



## Differential Thermostat Option

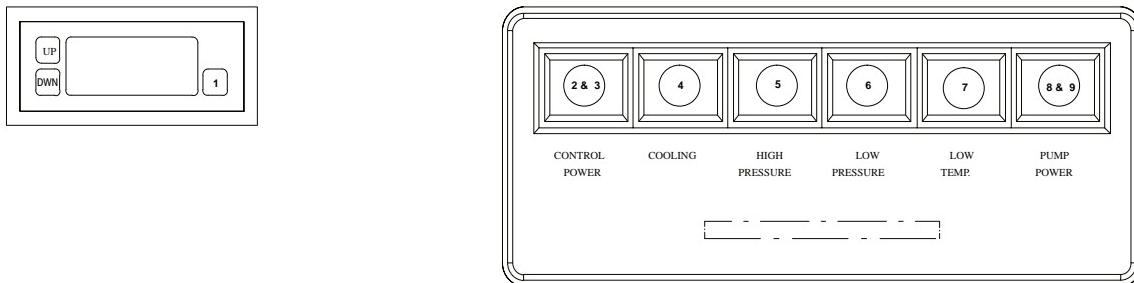
If the Chiller is equipped with a DIFFERENTIAL THERMOSTAT, the air probe will need to be located where ambient temperature is to be monitored. The set-point will be the temperature sensed by this probe. This set-point can be checked by pushing the "SET-POINT" button located on the upper right of the digital display. Releasing this button will display the system water temperature.

## Cooling Start-Up

Once flow is established and the thermostat is set to the desired set-point, turn the control power switch to "ON". Ensure that the air is flowing in the left side (facing the control panel) and out the right side. If not, reverse two of the three incoming power supply leads at the terminal strip. Once again, check for correct air flow. All alarm indicators should be extinguished and the Chiller refrigeration system will cycle in order to maintain the established set-point.

Re-check the reservoir level to ensure that it is "FULL" (if so equipped) and add water if necessary.

The Chiller is now ready for normal operation.



## Control Panel

1. **TEMPERATURE INDICATOR/CONTROLLER (Thermostat)-** Combines a precise temperature control and accurate set ability with a convenient LED temperature readout that indicates system liquid temperature.
2. **CONTROL POWER SWITCH-** A simple (ON/OFF) switch that switches power to the control circuit. This switch must be "ON" for the Chiller to operate.
3. **CONTROL POWER LIGHT-** A white light that indicates that Chiller control power is present.
4. **COOLING LIGHT-** A green light that indicates refrigeration system operation. This light cycles on and off in response to the thermostat.
5. **HIGH PRESSURE ALARM LIGHT-** A red light that indicates high refrigeration pressure.
6. **LOW PRESSURE ALARM LIGHT-** A red light that indicates low refrigeration pressure.
7. **LOW TEMPERATURE ALARM LIGHT-** A red light that indicates and abnormally low system fluid temperature.
8. **PUMP POWER SWITCH (OPTIONAL)-** A simple (ON/OFF) switch that switches power to the Chiller pump. This switch must be "ON" for the Chiller to operate.
9. **PUMP POWER LIGHT (OPTIONAL)-** A white light that indicates that the Chiller pump power is present.
10. **LOW FLOW/HIGH TEMPERATURE INTERLOCK (OPTIONAL)-** Contacts are energized when abnormally low fluid flow or an abnormally high fluid water temperature is sensed by Chiller controls.
11. **LOW LEVEL AUDIBLE ALARM (OPTIONAL)-** An audible alarm that indicates an unsafe reservoir level.

# MAINTENANCE

**CAUTION: Disconnect electrical power before performing any of the following maintenance procedures.**

The Chiller will require very little normal maintenance.

1. On AIR-COOLED Chillers, the **condenser fins** should be cleaned by blowing compressed air through the condenser from the fan side as required to eliminate any dirt or debris that may accumulate over time. This can severely reduce the performance of the Chiller. Cleanable air filters are available as an option. Contact the factory for information.
2. On AIR-COOLED Chillers the condenser **fan motor** should be lubricated every 6–months with a few drop of SAE10 oil.
3. The **pump motor** should be lubricated with thirty drops of SAE20 oil once a year.
4. The **circulation system** should be drained and flushed periodically to avoid build-up and possible restriction of flow by contaminates.
5. The **strainer** at the Chiller inlet should be removed and cleaned monthly.

# FLUID RECOMMENDATION

Remcor Chillers are designed to operate with water to provide maximum performance for temperatures of 40°F–100°F.

Distilled Water	Acceptable
De-Ionized Water (1–5 MEG/OHMS)	Acceptable
De-Ionized Water (5+MEG/OHMS)	Acceptable with Stainless Steel & PVC only *No Copper or Brass
Propylene Glycol (Lab & Industrial Grade)	Acceptable – 30% Glycol/70% Water *For Applications with Temperatures below 40°F
<b>Lab &amp; Industrial Grade Ethylene Glycol</b>	Acceptable – 30% Glycol/70% Water *For Applications with Temperatures below 40°F
Mineral/Hydraulic Oils (Viscosity<50 Centistrokes)	Acceptable
Ethylene Glycol <b>(Commercial/Automotive Antifreeze)</b>	<b>NOT Acceptable</b> <b>*Silicate Rust Inhibitors in Automotive/Commercial Antifreeze will damage pump seals and housing which lead to failure.</b>
Acidic/Basic Solutions (Above 8/Below 6 PH)	Not Acceptable
Mineral/Hydraulic Oils (Viscosity>50 Centistrokes)	Not Acceptable

For questions regarding special or other fluids contact IMI Cornelius Remcor at 800–551–4423.

To Purchase Lab or Industrial Glycol contact:

Hubbard Hall           (800) 648–3412 – Dow Therm SR1 available in 5 gallon  
IMI Cornelius          (800) 551–4423 – Part# 111521000 5 gallons

# TROUBLESHOOTING

**IMPORTANT:** Only qualified personnel should service internal components or electrical wiring.



**WARNING:** If repairs are to be made to the refrigeration system, make sure electrical power is disconnected from the unit.

Trouble	Probable Cause	Remedy
CHILLER DOES NOT OPERATE. CONTROL POWER LIGHT "OFF"	A. Control power switch "off". B. No power. C. Defective power supply connection. D. Defective control power switch. E. Defective control transformer. F. 3-Phase Monitor tripped	A. Turn the control power switch to the "on" position. B. Check the fuse and circuit breaker. C. Check wiring and correct loose or poor connections. D. Replace the switch. E. Replace the transformer. F. Check for correct voltage level on each phase of incoming 3-Phase power. Check for correct phase rotation.
PUMP DOES NOT OPERATE. PUMP POWER LIGHT "OFF"	A. Pump power switch "off". B. Defective pump power switch. C. Defective control transformer.	A. turn the pump power switch to the "on" position. B. Replace the switch. C. Replace the transformer.
PUMP DOES NOT OPERATE. PUMP POWER LIGHT "ON".	A. No water in reservoir. B. Restriction in the line to or from the Chiller. C. Open or defective pump overload relay. D. Defective pump contactor. E. Defective pump motor or damaged impeller.	A. Fill reservoir. B. Remove restriction. C. Manually reset the relay or replace if necessary and check amp setting on overload. D. Replace the pump contactor. E. Replace the pump or impeller.
CHILLER DOES NOT COOL. COOLING LIGHT "OFF".	A. Defective thermostat.	A. Replace thermostat.
CHILLER DOES NOT OPERATE. COOLING LIGHT "ON".		
A. LOW PRESSURE ALARM LIGHT CYCLES ON/OFF.	A. Process water too cold. B. Low process water flow. C. Defective expansion valve.	A. Increase the thermostat setting. B. Ensure that there is adequate flow through the process piping. C. Replace the expansion valve.

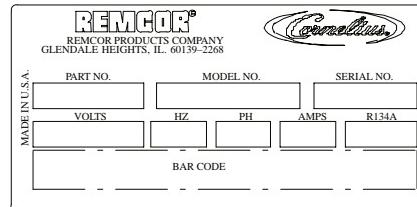
Trouble	Probable Cause	Remedy
	D. Refrigerant loss.  E. Water bypass valve failed.  F. Defective pump.	D. Check the sight glass. If bubbles are seen flowing through it, the Chiller needs to be leak checked and recharged with refrigerant.  E. Consult technical service department.  F. Replace pump.
HIGH PRESSURE ALARM LIGHT "ON".	A. Restricted condenser airflow.  B. Defective condenser fan and/or motor.  C. Defective expansion valve.  D. Low or no condenser water flow.	A. Clean the fins of the condenser and ensure that the air flow is not restricted.  B. Check to ensure that the fan blade is not blocked. Replace the fan motor if necessary.  C. Check to ensure that the fan blade is not blocked. Replace the fan motor if necessary.  D. Ensure that there is adequate flow through piping to condenser.
LOW TEMPERATURE ALARM	A. Low or no process liquid flow.  B. Defective thermostat.  C. Process water too cold - below 35° F.	A. Ensure that there is adequate flow through the process piping.  B. Replace the thermostat.  C. Increase the thermostat setting.

# SERVICE

When servicing a REMCOR Chiller, it is important to note the information contained on the data plate located in the upper rear of the unit.

If technical assistance is needed, the phone technician will need the Serial Number of your Chiller. That information is found on the Data Plate along with the model number, voltage requirements and refrigerant information.

The Serial Number is also needed when replacement parts are being ordered or for any warranty claims. See CHILLER WARRANTY PAGE.



**FIGURE 5. SAMPLE DATA PLATE FOR CH5002-A**

Be sure to include the serial number on any documentation or billing information.

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# **SAFETY CONTROLS**

Each Chiller is provided with three standard safety controls. These controls are arranged in series in the control circuit to automatically shut down the unit in the event that a condition exists which could be harmful to the refrigeration system components. This section includes a brief description of each control, its location and some troubleshooting hints that may be helpful.

## **HIGH PRESSURE CONTROL (HPC)**

This control prevents system operation in the event that the high side pressure exceeds 350 PSIG. If this occurs, check the following:

1. That the condenser is clean and that the air inlets and outlets are unobstructed.
2. That the ambient temperature at the chiller location is below 110°F.
3. That the fan blade is rotating.

Press the reset button located on the front of the control to restart the chiller. This control is located in the upper left hand corner of the electric box. If the control opens again, check the control setting with refrigeration gauges. If the setting is correct, contact technical service department.

## **LOW TEMPERATURE CONTROL (LTC)**

This control prevents system operation in the event that the fluid inside the evaporator falls below 35°F. If this occurs, check the following:

1. That the thermostat set point is set at 40°F or greater.
2. That the flow through the system is greater than 2 gallons per minute.

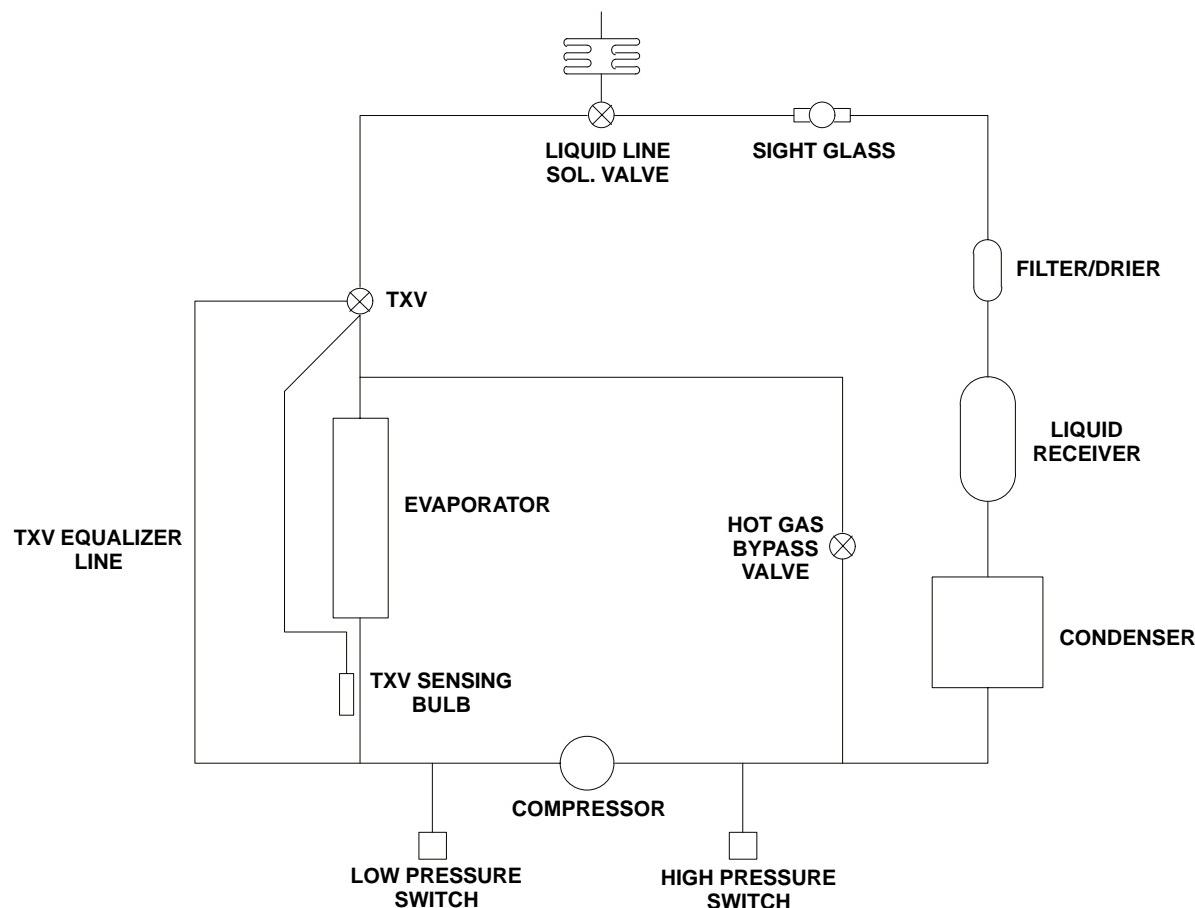
This control is mounted in the lower left hand corner of the electric box. It automatically resets itself once the water temperature is restored to 38°F. The low temperature control may be adjusted for lower temperatures if a glycol solution is used. Contact Technical Service Department for temperatures below those stated here (See Fluid Recommendations page).

## **LOW PRESSURE CONTROL (LPC)**

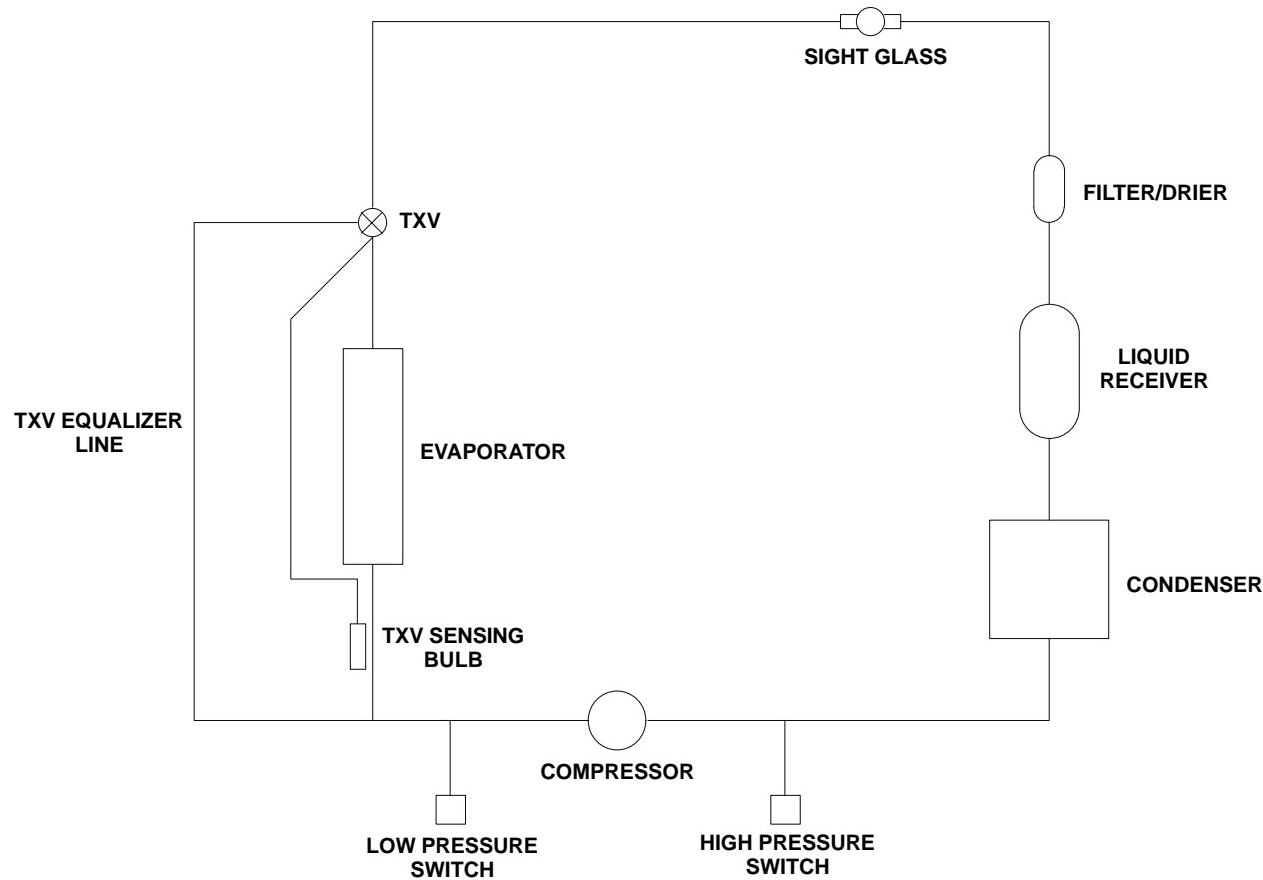
This control prevents system operation in the event that the low side pressure falls below 44 psi. If this occurs, check the following:

1. That the thermostat set point is set at 40°F or greater.
2. That the flow through the system is greater than 2 gallons per minute.
3. That no bubbles are present in the sight glass.
4. That water bypass valve allows flow through the Chiller in a "dead head" situation.

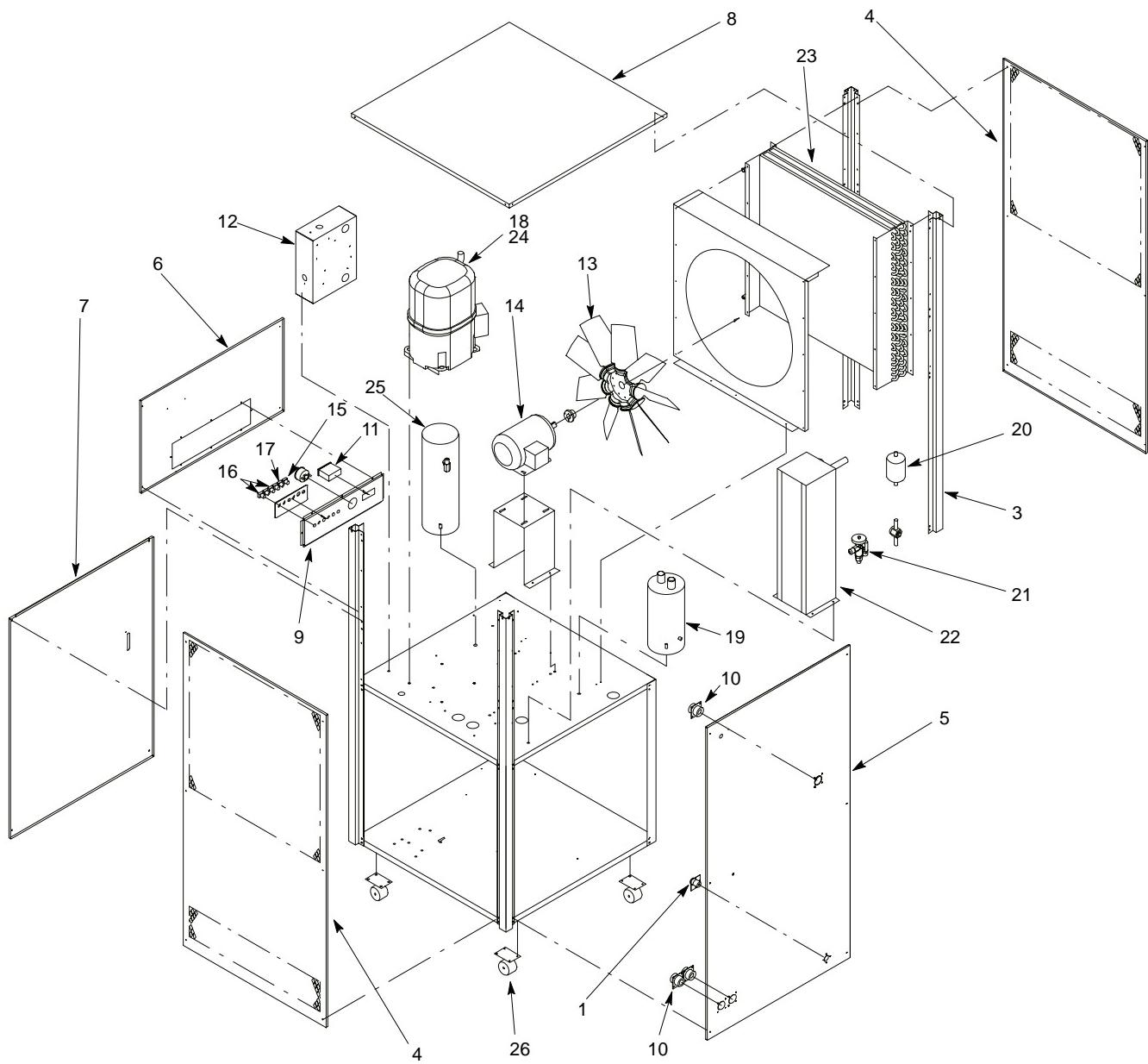
This control is located to the right of the high pressure control in the electric box. It automatically resets itself once the low side pressure rises to approximately 64 psi. If the control opens again, check the control setting with refrigeration gauges. If setting is correct, contact Technical Service Department.



**FIGURE 6. REFRIGERATION PIPING SCHEMATIC WITH HOT GAS BYPASS**



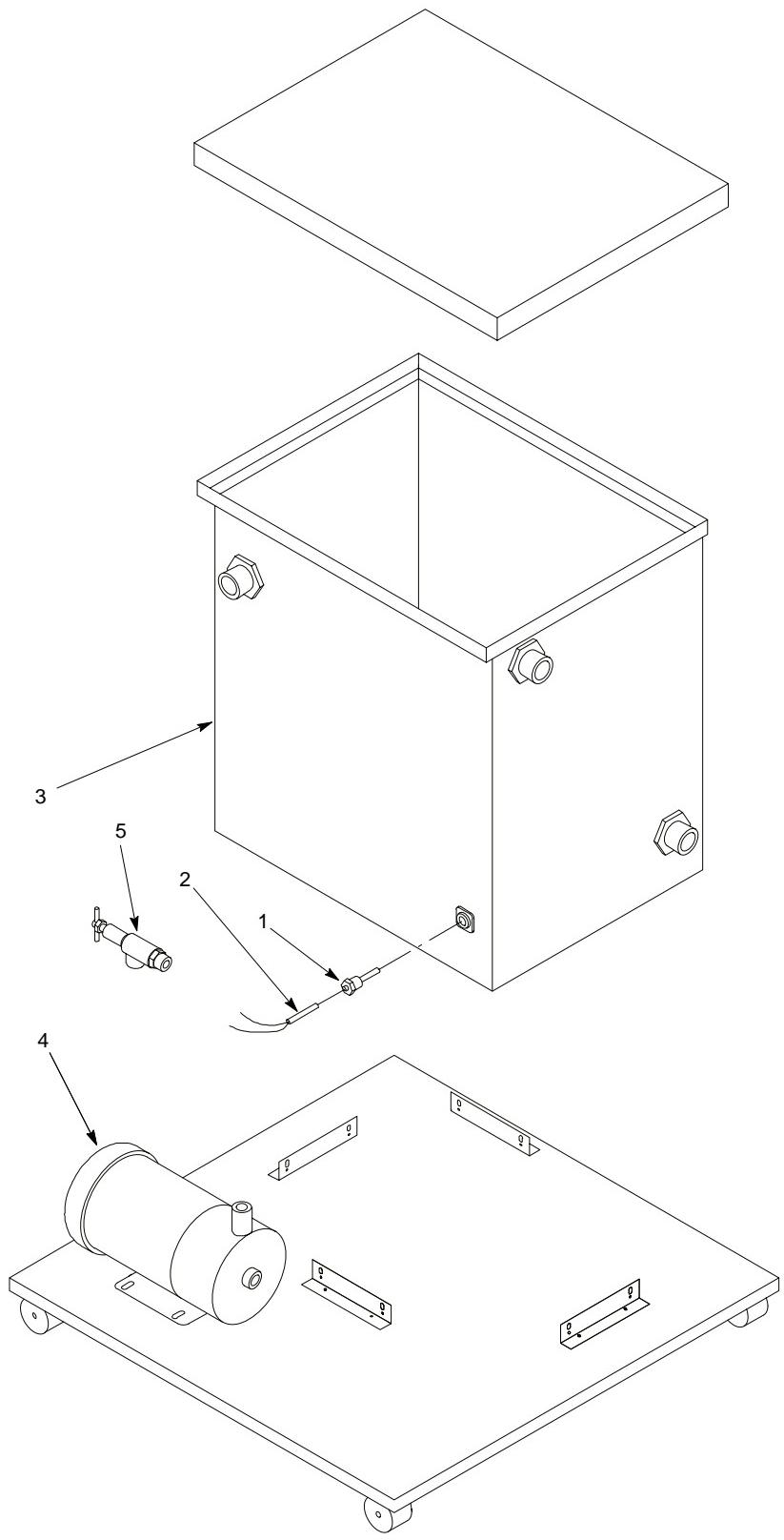
**FIGURE 7. REFRIGERATION PIPING SCHEMATIC WITHOUT HOT GAS BYPASS**



**FIGURE 8. CHILLER PARTS BREAKDOWN**

Index No.	Description
1	1/2" FPT Coupling
2	Thermowell, Low Temp. Thermostat (Not Shown)
3	Corner Cover
4	Side Panel
5	Rear Panel
6	Upper Front Panel
7	Lower Front Panel
8	Lid
9	Control Panel
10	FPT Coupling
11	Temperature Control
12	Electric Box Assembly
13	Fan Blade
14	Fan Motor
15	White Switch/Indicator

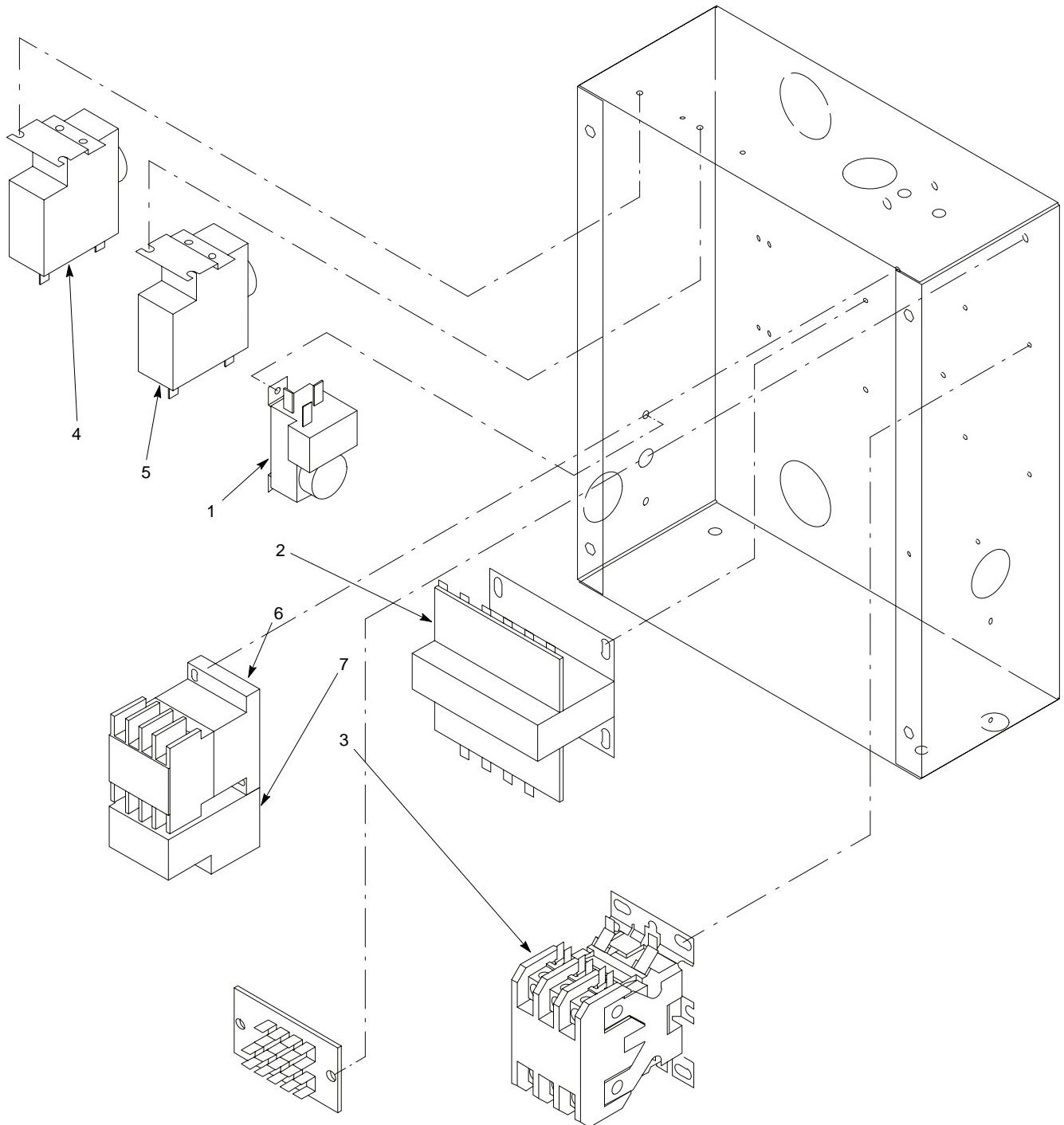
Index No.	Description
16	Red Indicator
17	Green Indicator
18	Compressor
19	Accumulator
20	Filter/Drier
21	TX Valve, R-22
22	Evaporator Assembly
23	Condenser
24	Compressor
25	Receiver
26	Caster
NS	Condenser, Water Cooled
NS	Regulating Valve, Water Cooled Condenser
*	Call the Remcor Service Department for Proper Panel.



**FIGURE 9. PUMP AND TANK COMPONENTS**

Index No.	Description
1	Thermowell, Temperature Control
2	Temperature Probe
3	Tank Assembly

Index No.	Description
4	Pump
5	Pump Relief Valve
** Call the Remcor Service Department for proper pump identification.	



**FIGURE 10. ELECTRICAL BOX COMPONENTS**

Index No.	Description
1	Low Temperature Thermostat
2	Control Transformer
3	Contactor, Compressor
4	High pressure Control
5	Low Pressure Control

Index No.	Description
6	Contactor, Pump
7	Overload Relay, 1.0 to 1.6A
	Overload Relay, 1.4 to 2.0A
	Overload Relay, 2.0 to 3.0A
	Overload Relay, 2.8 to 4.4A
	Overload Relay, 4.0 to 6.0A

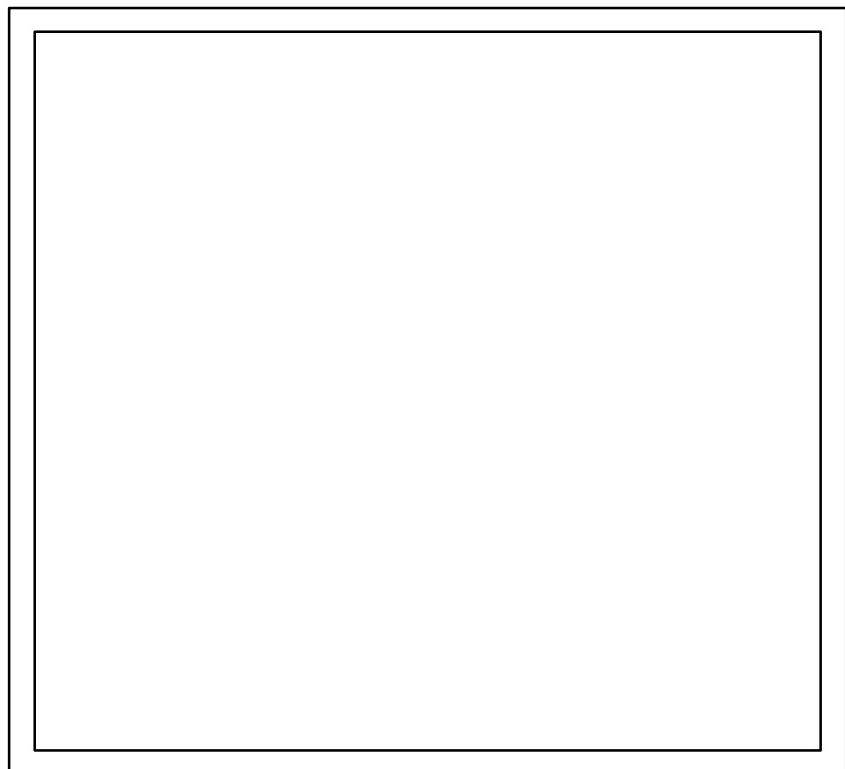
## **WARRANTY**

IMI Cornelius Inc. warrants that all equipment and parts are free from defects in material and workmanship under normal use and service. For a copy of the warranty applicable to your Cornelius, Remcor or Wilshire product, in your country, please write, fax or telephone the IMI Cornelius office nearest you. Please provide the equipment model number, serial number and the date of purchase.

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4/21/98



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